LSST Processing of DES data

By N. Kuropatkin

What is done:

1.Installed LSST stack v 7_2 on DES cluster.

2.$ git clone git://github.com/LSST-nonproject/obs_file.git

$ cd obs_file

$ setup -t v7_2 -r .

$ scons

This creates executable program I used for the DES data processing.

3. I have used DES0659-5540_Y.fits file which is coadded tile image with most artifacts (cosmic rays, etc.) removed. The file was converted to meet LSST standard with image, mask map and variance layers.

The command I run is: processFile.py

./testdes calexp=DES0659-5540_Y.fits -C overrides.py --clobber-config

The overrides.py gives me possibility to change configuration parameters.

This produces src.fits file containing LSST catalog that need to be compared with DES catalog file DES0659-5540_Y_cat.fits

RESULTS

- To compare DES and LSST magnitudes I calculate LSST magnitudes as

  Mag = 28.01121 – 2.5*log10(flux)

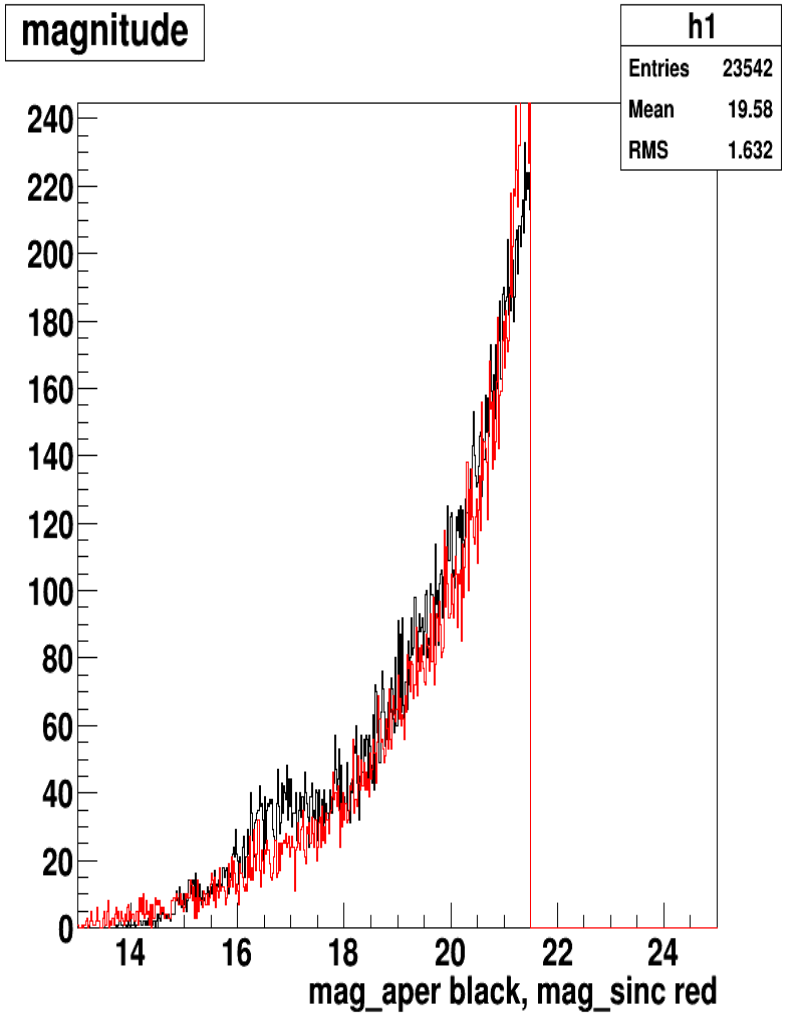
The zeropoint 28.01121 was set by matching LSST psf magnitudes to DES psf magnitudes.

LSST detection has cut-off at mag_psf about 21.5

To get correct comparison I have to cut DES magnitudes at the same value.

Before matching DES catalog contains 23543 objects, and LSST catalog contains 21976 objects.

Distribution of magnitudes before matching



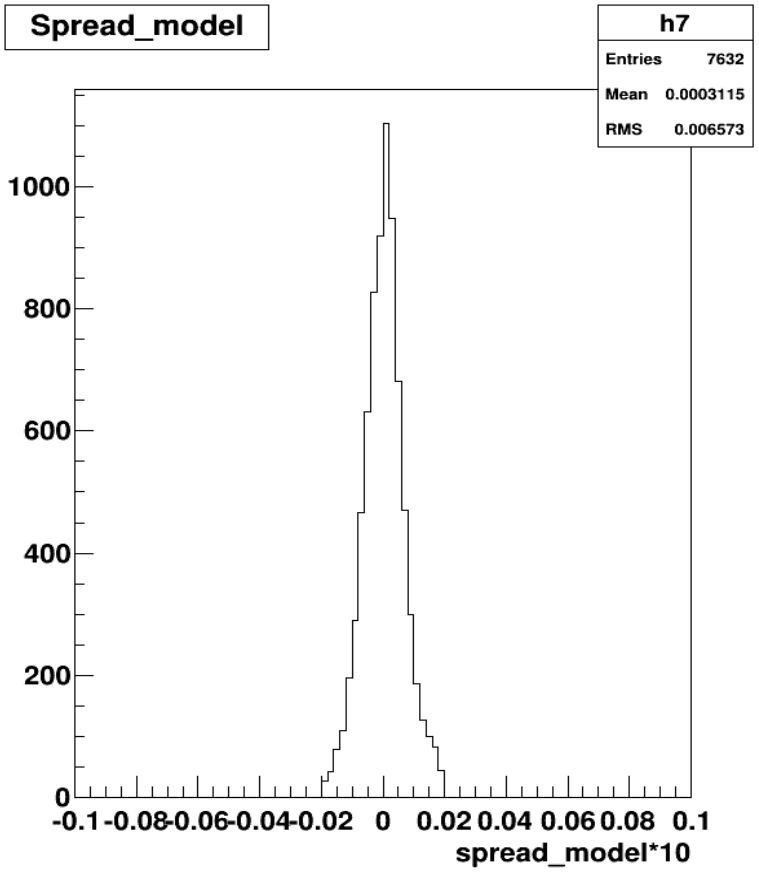
Matching process

- To match the two catalogs I have created java program that uses healpix indexing for fast matching. The matching radius of 1 arcsec. was used.
- Out of 21976 objects in the LSST catalog 19496 objects have match in the DES catalog (~87%).

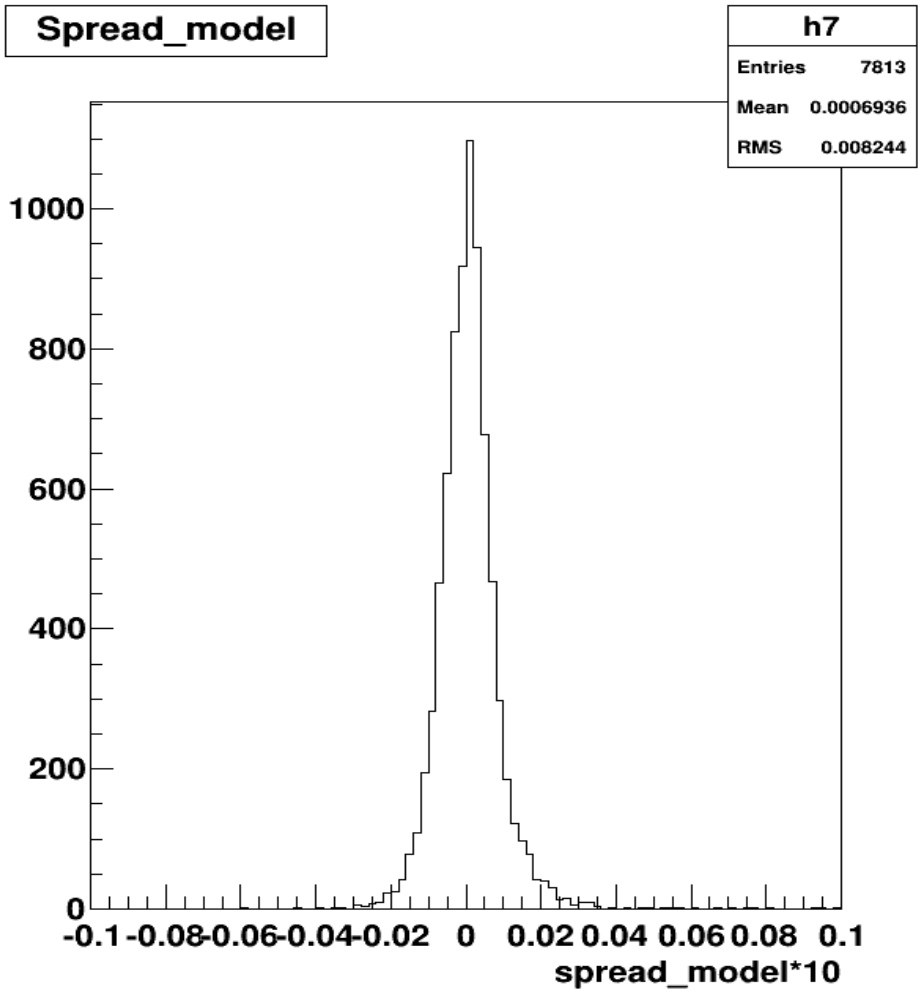
Star-galaxy separation.

- For DES I have used spread_model parameter to distinguish stars. Accepted cuts on the function to select stars is {-0.002 ,0.002}. I also put cut on mag_psf to be < 20.
- For LSST class_ext variable is used. Its value 0 for stars and 1 for galaxies.
- To demonstrate how the selections are working I plot the spread_model distribution with accepted cuts.

Spread_model for stars

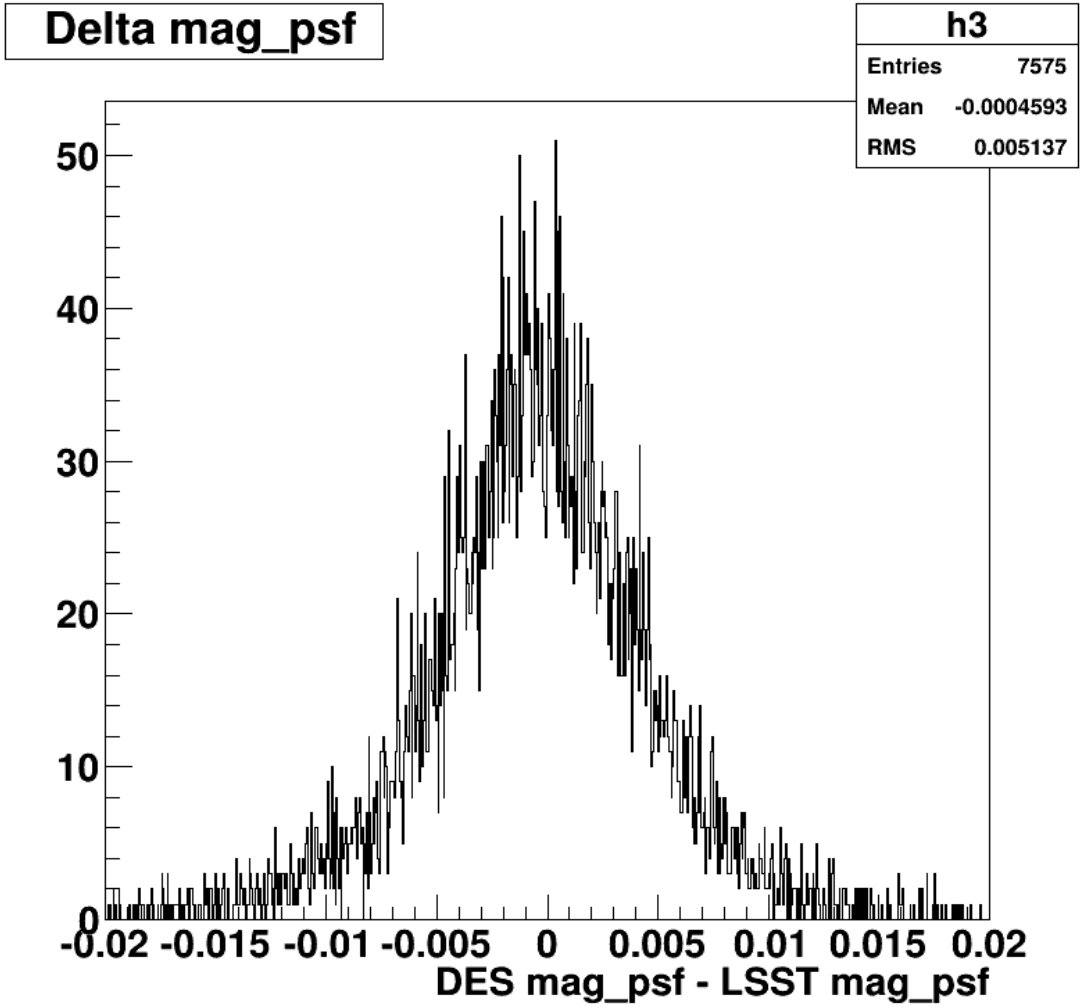


Spread_model with class_ext=0

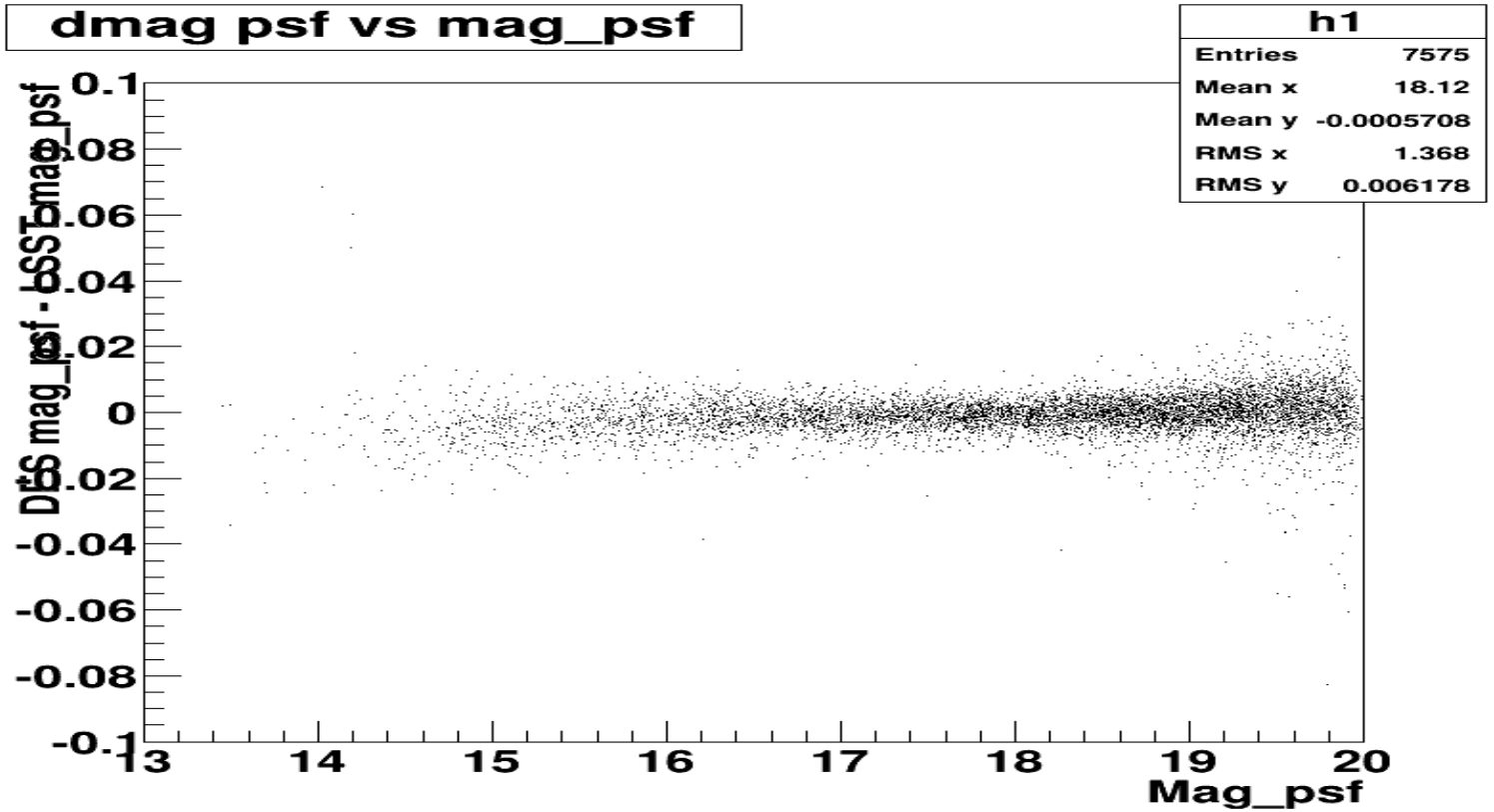


- These two plots show that both selectors are working almost equally well.
- To select a pure sample of stars I use both spread_model and class_ext simultaneously.
- Now, for selected stars I plot difference between DES mag_psf and LSST mag_psf

Delta mag_psf distribution



Delta mag_psf vs mag_psf

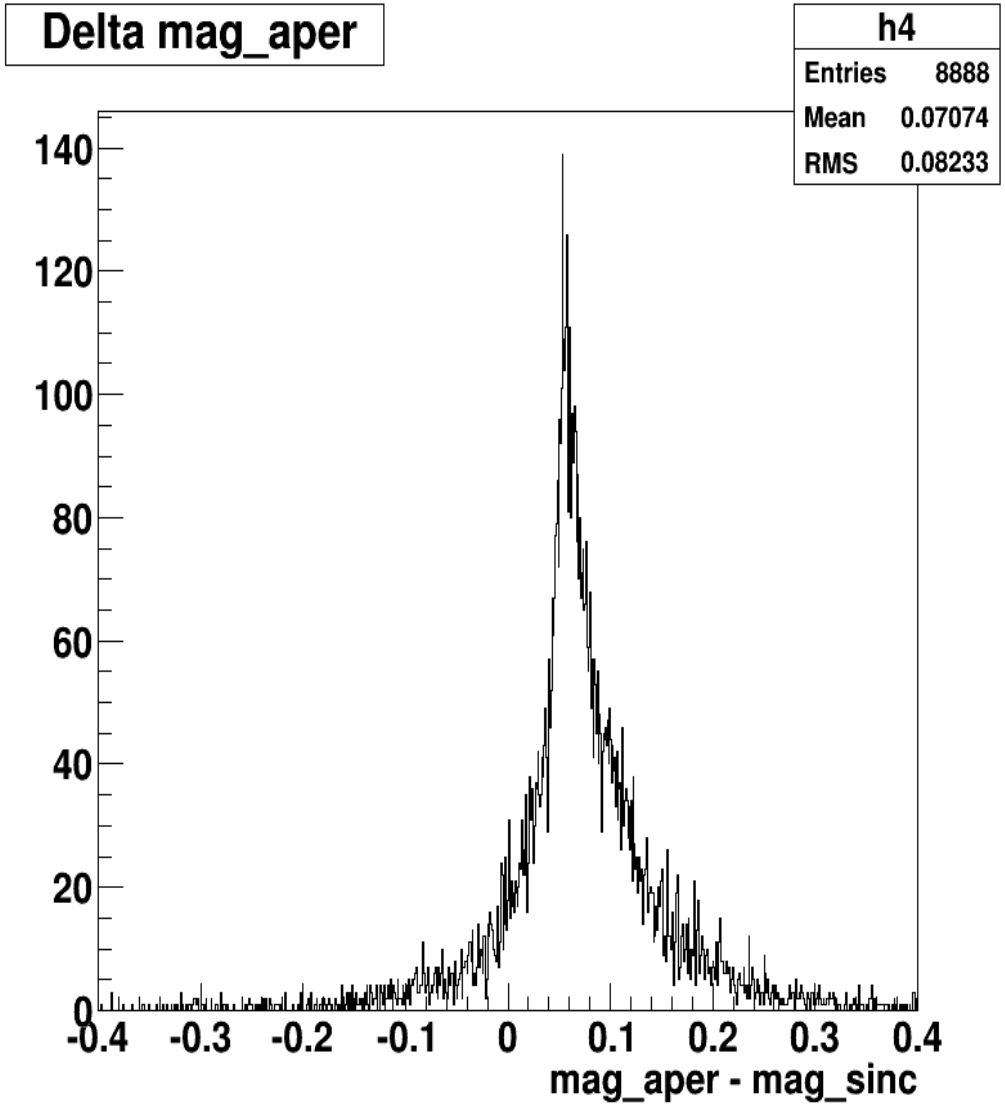


Galaxies detection.

- To select galaxies I was using spread_model > 0.002 cut, and class_ext = 1
- Comparison was done using mag_sinc for LSST and mag_aper for DES.
- To make the comparison possible I have changed the

['flux.sinc'].radius2=5.55 to be the same as in selected DES mag_aper.

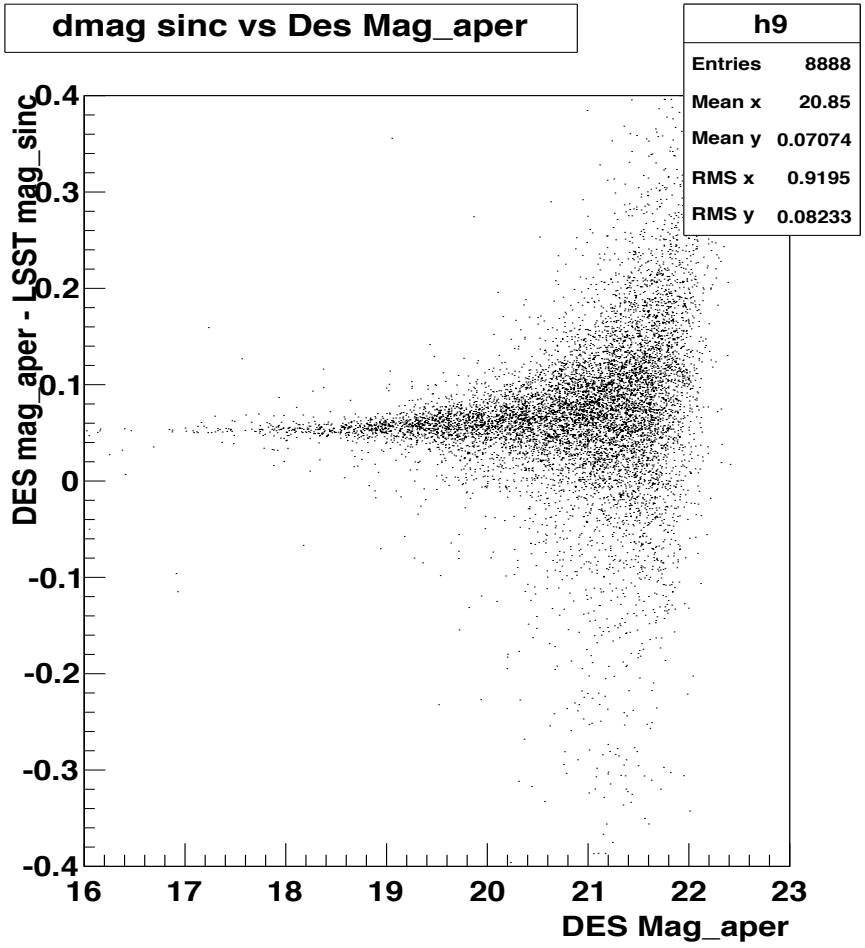
Comparison of galaxy magnitudes



One can see small shift (0.07 mag) in the peak position. This is due to zeropoint being set by matching LSST and DES stars, not galaxies.

See the next slide showing magnitude dependence of the

mag_aper –mag_sinc distribution.


dmag sinc vs Des Mag_aper
h9
Entries 8888
Mean x 20.85
Mean y 0.07074
RMS x 0.9195
RMS y 0.08233
DES mag_aper - LSST mag_sinc
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
16
17
18
19
20
21
22
23
DES Mag_aper

Unsolved problems.

- It is not clear what parameter is responsible for LSST cut off at the magnitude 21.5

Attempt to decrease root.detection.thresholdValue leads to growing peak of junk at mag=21.5

Neither of attempted tweaks resolved the problem.

I have no time to dig in the code right now.